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14. ABSTRACT  Our multi-team group (Los Alamos National Laboratories (LANL) and Children's Hospital Boston and Harvard Medical School) aims to develop the next-generation ultrasound (US) technology that combines the biomechanical aspects of cancer progression with advanced 3D image reconstruction. The UNM team will initially create imaging case studies that compare findings of common pathology and normal anatomy of the conventional modalities and US tomography. UNM will use this information for subsequent patients to validate or at least clarify the value of this new US tomography information. UNM will also supply Harvard with biopsy specimens for analysis of tissue structure and mechanics. Standard imaging that UNM will use for comparison with US tomography are magnification mammography, conventional mammography, conventional sonography, contrast enhanced MRI, and breast biopsies. Study participants will be selected after undergoing conventional work-up mammography. Patients will undergo high-resolution US with existing clinical sonography compared images from the US tomography device developed at LANL.					
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## **Introduction**

The ultimate goal of this research is to develop a novel, safe, and cost-effective imaging technique to vastly enhance breast cancer screening and diagnostic imaging. We will integrate the innovative ultrasound tomography technology with recent discoveries in the field of cell and tissue biomechanics, a fundamental shift of paradigm needed to improve sensitivity and specificity of breast cancer imaging.

## **Body**

In accordance with Task 4.1a, we have submitted two separate applications to our Internal Review Board; one covering the additional scan and the other covering the additional biopsies. Both have been reviewed and have received conditional approval from the committee with minor modification. Final approval is expected to be received in October. The timeline for approval outlined in the statement of work was between months 12 and 18. Completion of this task falls well within the timeline.

## **Key Research Accomplishments**

Currently, there are no subjects enrolled since the test ultrasound machine is in the design and construction phase. We have had numerous interdepartmental planning sessions between the Department of Radiology and Outpatient Surgery and Imaging to work out space utilization, installation and staffing considerations. We continue to work with Los Alamos National Labs and the fabrication companies on the design of the machine and safety parameters (electrical and power outputs) of the table and water bath. Our radiology team has developed an image rating scale for comparison with traditional ultrasound.

Dr. Williamson and Elizabeth Harris (patient advocate) attended the Era of Hope conference in Florida, August 4, 2011. Dr. Williamson and Patient Advocates presented posters. Patient advocates have been working on obtaining certifications on Biomedical CITI training, HIPPA training and patient group facilitator training. Defining their roles, organizing the group. completing UNM contracts paperwork, creating a Drop Box and SocialGo site for Advocates communications and work. Patient Advocates are planning a site visit to Albuquerque, NM in November and a multi-team conference is being planned.

## **Reportable Outcomes**

Not applicable at this phase.

## **Conclusion**

We will continue to follow the tasks and timeline outlined in the Statement of Work.

## **References**

Not applicable at this phase.

## **Clinical Study of Ultrasound Tomography for Breast Cancer Characterization**

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Breast cancer is the second-leading cause of cancer death among American women. Early detection is a key factor to reducing the number of deaths. One of the primary limitations of conventional ultrasound for cancer screening and evaluation is its limited ability to identify and characterize breast tumors, and specificity of soft tissue findings.

Our multi-team group (in conjunction with Los Alamos National Laboratories and Children's Hospital Boston and Harvard Medical School) aims to develop the next-generation ultrasound technology that combines the biomechanical aspects of cancer progression with advanced 3D image reconstruction, with the ultimate goal of boosting the effectiveness of breast cancer screening modalities. The University of New Mexico (UNM) will undertake clinical studies and compare ultrasound tomography results with traditional imaging modalities (mammography, MRI, sonography) in known benign and malignant clinical cases.

The UNM team will initially create imaging case studies that compare imaging findings of common pathology and normal anatomy of the conventional modalities and ultrasound tomography. UNM will use this early information and experience for subsequent patients to validate or at least clarify the value of this new ultrasound tomography information. UNM will also supply Harvard with biopsy specimens for analysis of tissue structure and mechanics. Our objective is to recruit a minimum of 200 patients during the two-year period of the clinical testing. UNM will recruit only those patients with findings on conventional imaging.

The standard imaging modalities that UNM will use for comparison with ultrasound tomography are magnification mammography, conventional mammography, conventional sonography, contrast enhanced MRI, and breast biopsies. Study participants will be selected after undergoing conventional work-up mammography with additional routine mammographic views plus magnification views and sonography as needed. All patients will undergo high-resolution ultrasound with existing clinical sonography machines at the area of concern. The patients will then undergo an additional examination using the ultrasound tomography device developed at Los Alamos National Laboratory. The initial UNM goals are clarification of the research protocol, and obtaining IRB approval.